



Accelerating the Transition to More Energy Efficient Air Conditioners in Indonesia

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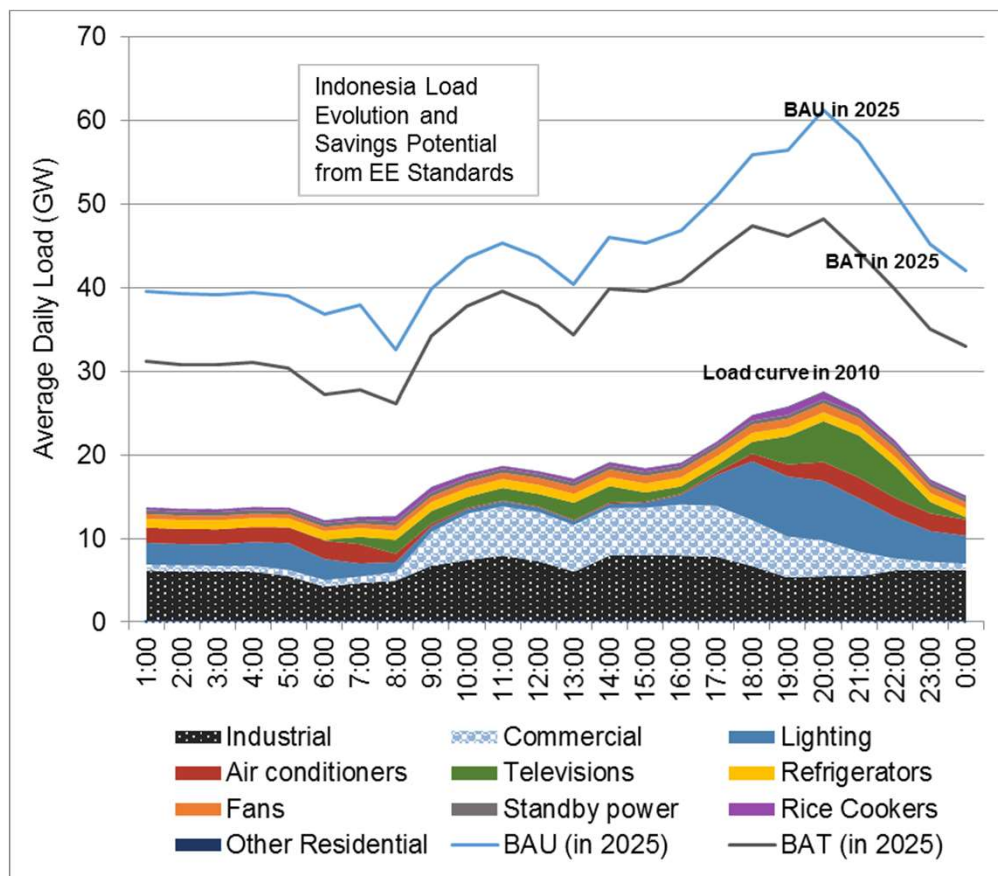
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Why focusing on ACs?



Source: LBNL BUENAS - McNeil et al 2019

Indonesia plans to add 56GW of capacity by 2027 (mostly thermal) resulting in over \$ 100 billion investment.

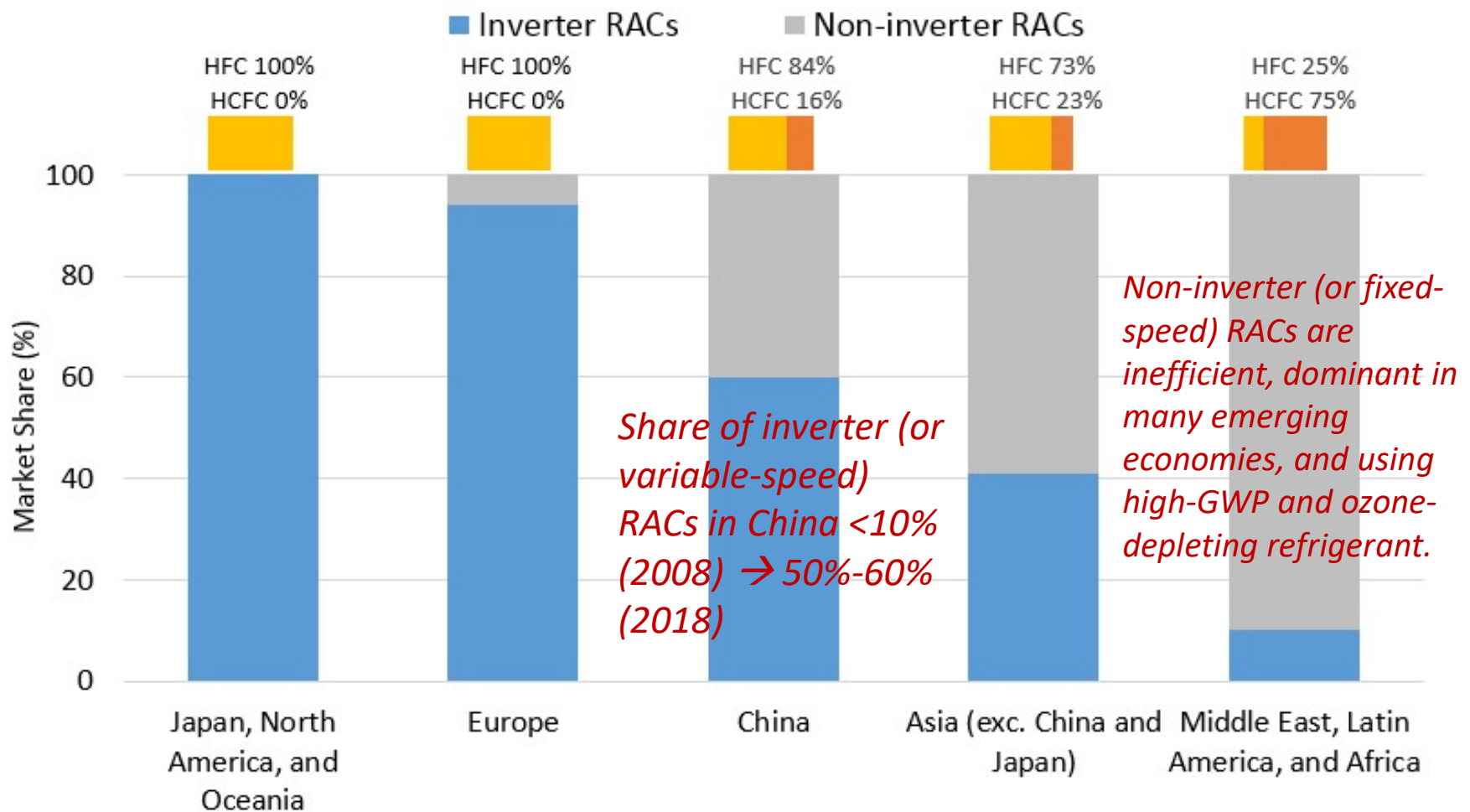
LBNL identify 13 GW savings from EE policy for appliances by 2025, thus bridging gap for additional capacity needs.

Biggest demand reduction by far comes from EE air conditioners due to

- (1) high growth - 7% per year
- (2) peak coincidence -30% peak due to AC in 2025 / 20GW
- (3) strong technology opportunity - inverter ACs

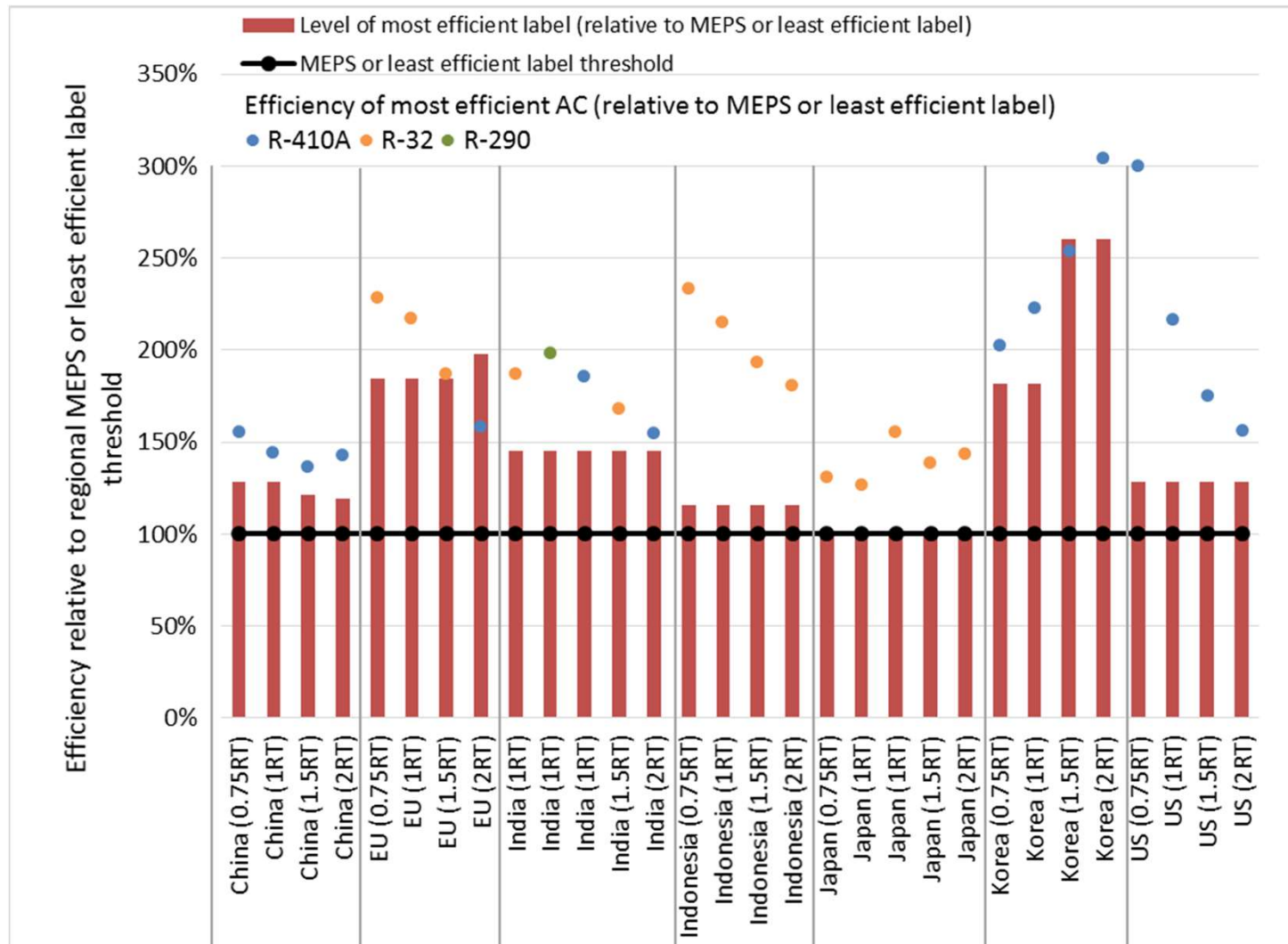
Current policies (ASEAN SHINE, 2020) achieve very limited results. Trajectory needs to be revised to capture the potential afforded by EE.

The global room AC market is in the midst of transition toward energy-efficient and sustainable technologies.



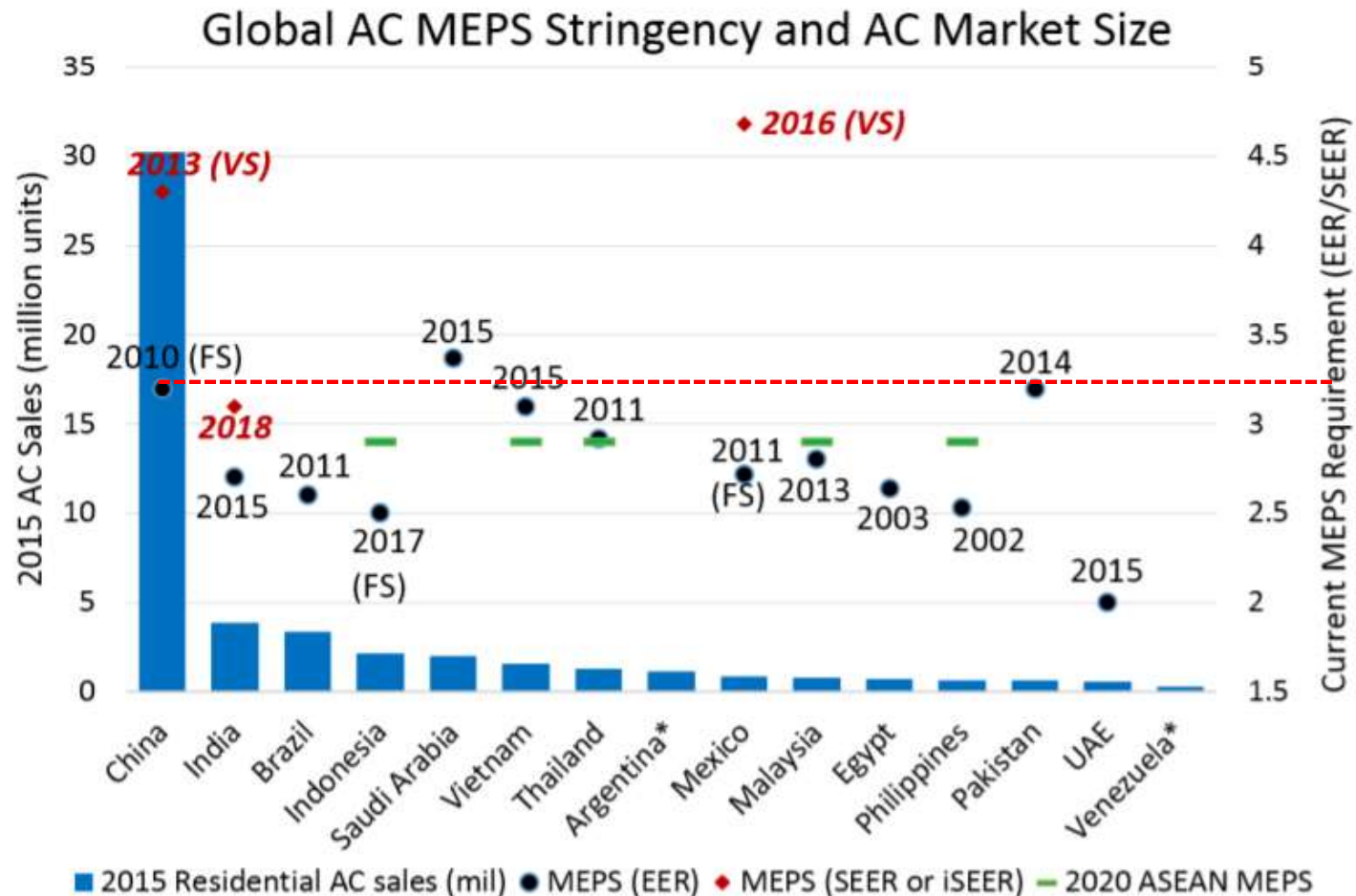
Source: The Japan Refrigeration and Air Conditioning Industry Association (JRAIA) and LBNL estimates

There is significant opportunity to improve AC efficiency using commercially available technology and to design market-transformation programs in many economies.



Source: Park et al. (2017) Assessment of commercially available energy-efficient room air conditioners including models with low global warming potential (GWP) refrigerants

Existing requirements show significant room for efficiency improvement in emerging economies.



Source: Shah et al. (2017) Opportunities for Simultaneous Efficiency Improvement and Refrigerant Transition in Air Conditioning

Notes: * denotes no information available on efficiency requirements for current or proposed MEPS. VS is variable-speed; FS is fixed-speed. SEER (seasonal energy efficiency ratio) and EER are not directly comparable.

Recent policy developments and opportunity for harmonization

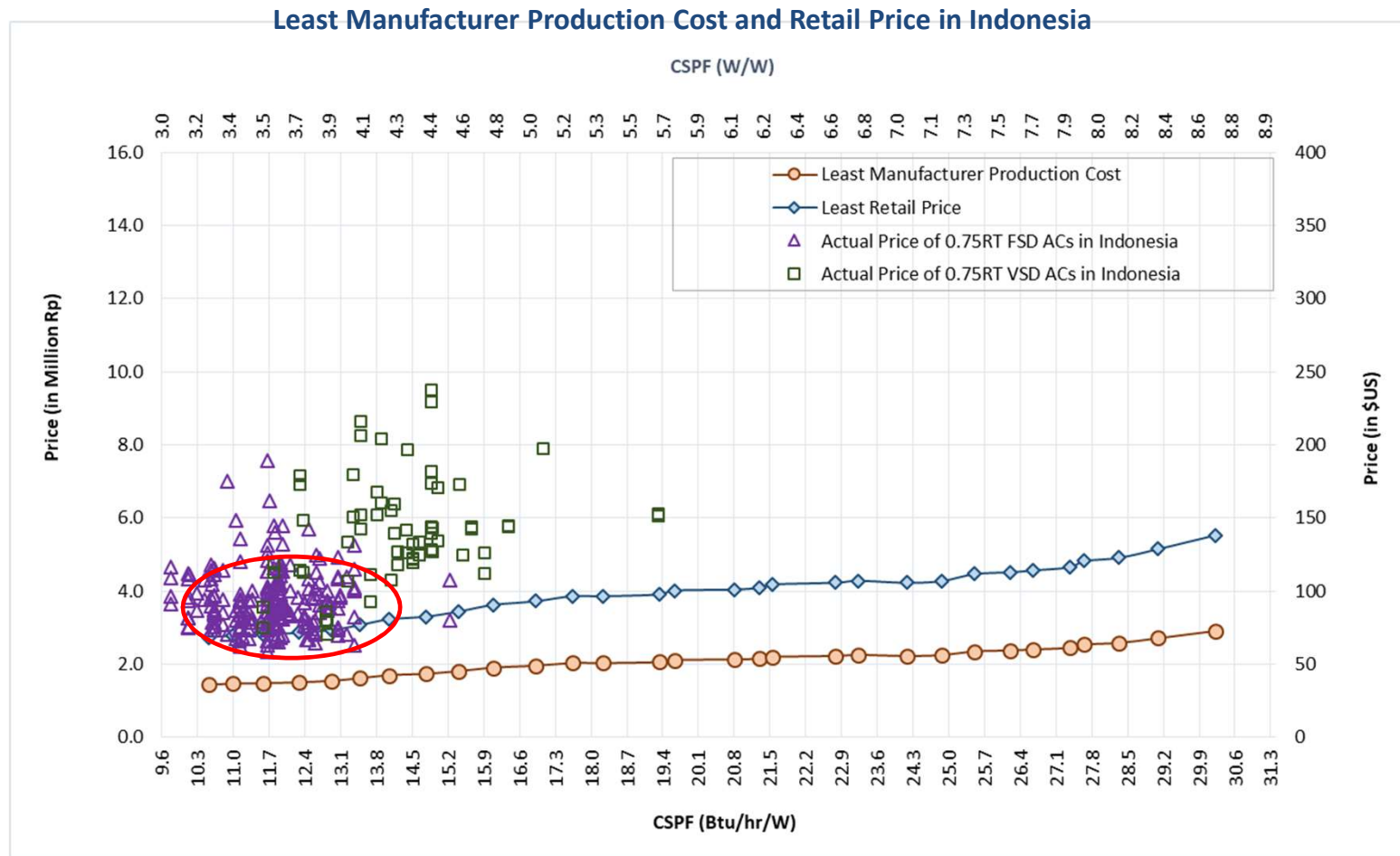
- China -the world largest producer (~70%) of the world's room ACs - is currently revising its MEPS/label - improves MEPS for fixed-speed ACs by 32-54% and will drive down cost of efficient ACs
- UN Environment U4E model regulations set MEPS/Label levels at the draft issued by China, presented in Twinning Workshops to Energy and Ozone Officials from about 130 countries in partnership with UNEP, ASHRAE, UNDP, UNIDO, GiZ, World Bank, KCEP in Paris in February 2019, with significant interest in their adoption worldwide

The potential MEPS and labeling requirements for ACs in Indonesia can be set, harmonizing the policy action with the expected improvement in China S&L and international effort such as the U4E model regulation guidelines.



Good AC energy efficiency is not necessarily expensive.

- ❑ Manufacturing costs and retail prices do not necessarily increase between low energy efficiency (CSPF 10.0) and good energy efficiency (CSPF 13.0).
- ❑ Many efficient products are already available (see green squares).



Note: Retail data cost and efficiency collected from Indonesia market in 2016-2017 (IDEA – Letschert et al. 2017)

Recent Achievements from Indonesia Program

- In December 2019, a new MEPS and 5-star label scheme have been agreed upon by the Ministry of Energy and Mineral Resources (MEMR) and its stakeholders.
- This revision includes a Cooling Seasonal Performance Factor (CSPF) metric, consistent with international best practice and a significant improvement of the label categories over the 2020 MEPS.
- The highest efficiency category is now set at 60% and above over the MEPS, which will help transform the market towards efficient ACs.

Proposed Decree regarding Indonesia AC MEPS and Labels (2020)

| Star Level | Efficiency in CSPF (Btu/hr/W) | Equivalent |
|---------------|-------------------------------|------------------------------|
| 1 Star (MEPS) | 10.58 | ASEAN SHINE 2020 target |
| 2 Star | 11.60 | NA |
| 3 Star | 12.96 | NA |
| 4 Star | 14.33 | NA |
| 5 Star | 17.06 | Thailand 5 Star Label (2019) |

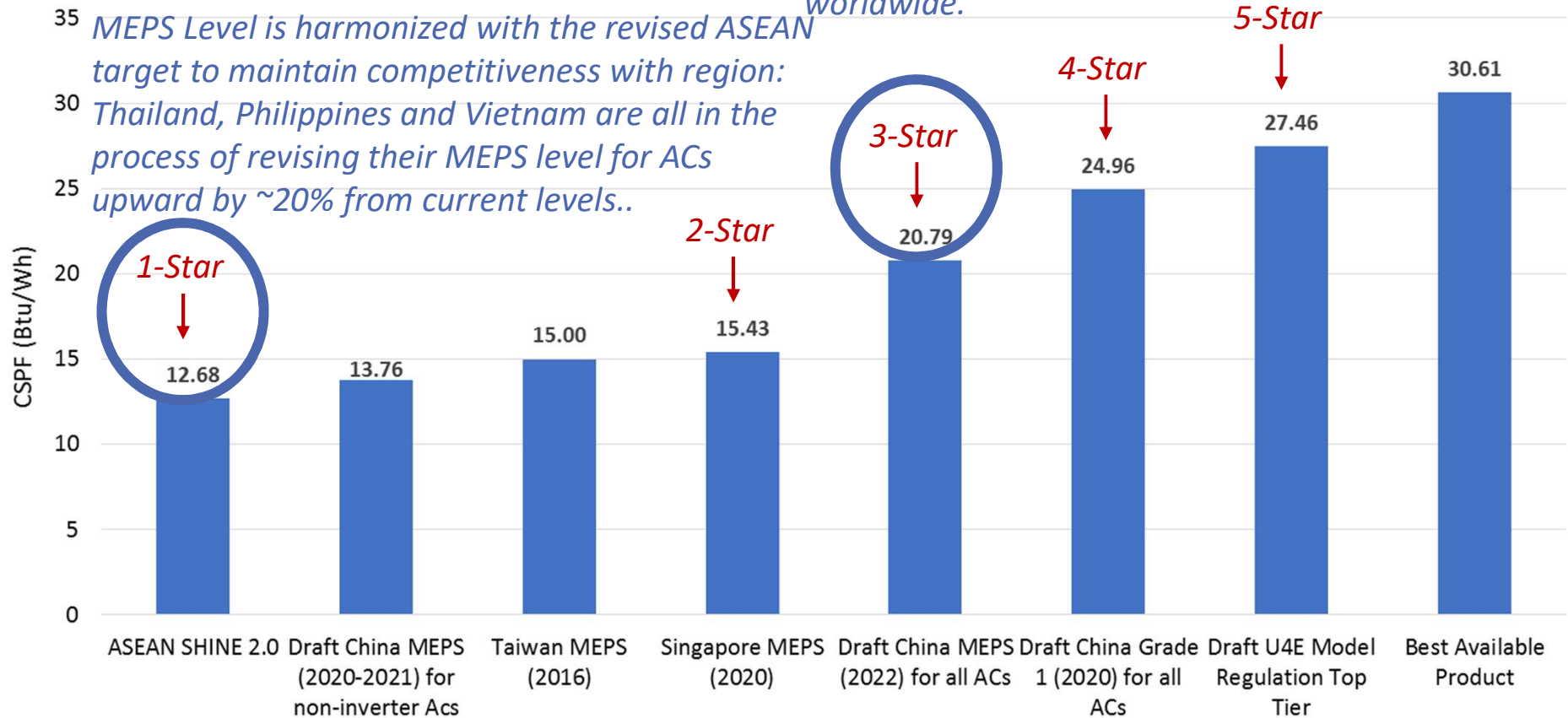
However, the MEPS target remains low, even below the MEPS China adopted in 2010 (10.91 Btu/hr/W). Because China manufactures about 70% of the world's mini-split ACs, and its domestic market accounts for roughly 30% of global AC sales, the low MEPS fail to capture the economies of scale, low upfront costs, and significantly higher life-cycle savings and environmental benefits that could be realized by aligning with China's MEPS.

The 5-Star label threshold is also 43-50% less than the efficiency of global best available

products.

LBNL Proposed MEPS and Labeling Requirements

3-star Level is harmonized with the China 2022 standard. China's standard revision is expected to drive down the cost of efficient ACs significantly worldwide.



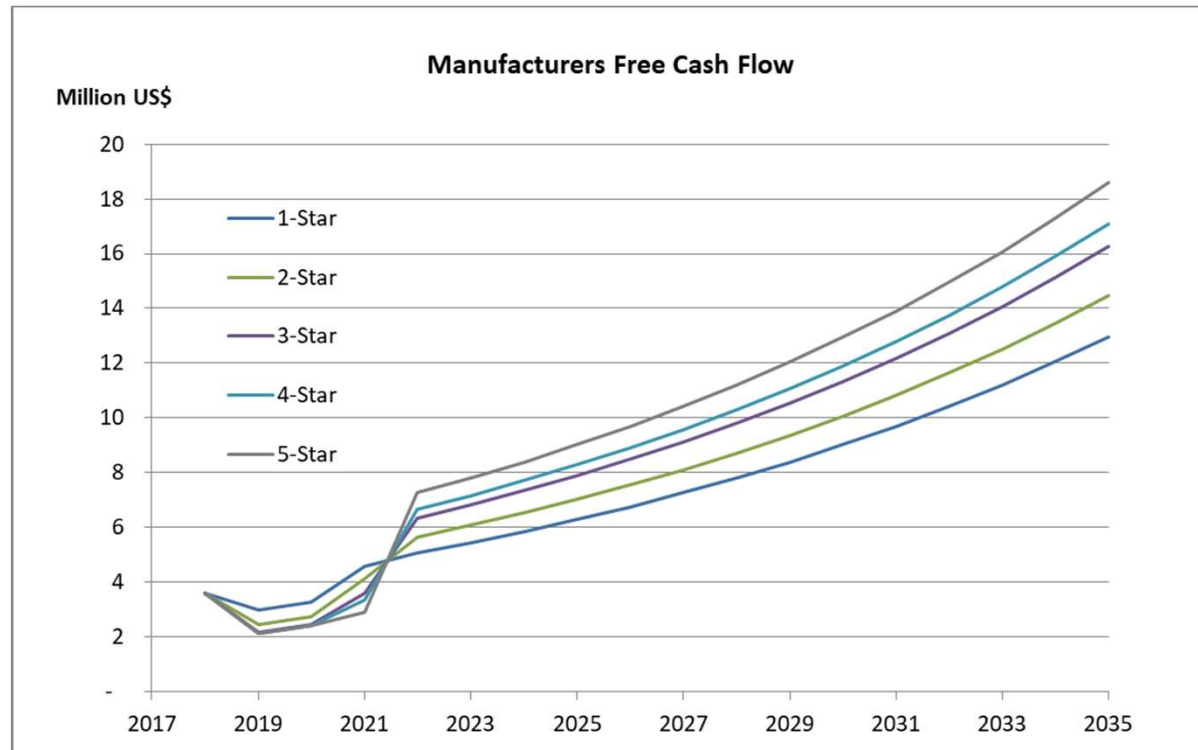
Consumer, National and Manufacturer Impacts Summary scenarios (with specified MEPS effective in 2021)

| | MEPS* at CSPF= 12.68 | MEPS at CSPF= 15.43 | MEPS at CSPF= 20.79 | MEPS at CSPF= 24.96 | MEPS at CSPF= 27.46 |
|--|--------------------------------------|-----------------------------------|--|--------------------------------------|--------------------------------------|
| Equivalent to: | Revised ASEAN target 1 Star | Singapore (2020) 2 Star | Potential China MEPS (2022) 3 Star | China Grade 1 (2020) 4 Star | U4E High Efficiency 5 Star |
| LCC Savings (\$US) | \$18 | \$32 | \$69 | \$89 | \$94 |
| Payback Period (years) | 1.4 | 2.7 | 2.7 | 2.7 | 2.8 |
| Annual Energy Savings in 2035 (GWh) | 3,263 | 9,170 | 19,840 | 25,522 | 27,829 |
| Energy Savings through 2035 (GWh) | 25,637 | 72,053 | 155,885 | 200,527 | 218,656 |
| CO2 Emissions Mitigation through 2035 (MT) | 21 | 60 | 130 | 167 | 182 |
| Avoided Generation Capacity in 2035 (MW) | 563 | 1,581 | 3,421 | 4,400 | 4,798 |
| Net Present Value (Million \$US) | 1,098 | 2,048 | 4,466 | 5,767 | 6,110 |
| Change in Industry Net Present Value (Million \$US) | 1.4 | 6.9 | 15.1 | 19.8 | 22.4 |

*Labels will only achieve a portion of the identified benefits compared to a MEPS

Source: Letschert et al. 2020

Focus on Manufacturer Impacts



| | MEPS at CSPF = 11.05 | MEPS at CSPF = 12.68 | MEPS at CSPF = 15.43 | MEPS at CSPF = 20.79 | MEPS at CSPF = 24.96 | MEPS at CSPF = 27.46 | MEPS at CSPF = 30.61 |
|---|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Product Conversion Cost (million US\$) | 0.4 | 1.1 | 1.5 | 1.7 | 1.7 | 1.7 | 2.1 |
| Capital Conversion Cost (million US\$) | 0.7 | 0.9 | 1.7 | 2.1 | 2.1 | 2.1 | 3.9 |
| Total Investment Required (million US\$) | 1.1 | 2.0 | 3.1 | 3.9 | 3.9 | 3.9 | 22.4 |
| Change in INPV (million US\$) | 0.9 | 1.4 | 6.9 | 15.1 | 19.8 | 22.4 | 33.7 |

Conclusions and Recommendations (1/2)

- LBNL impacts analysis demonstrates the benefits of AC EE for Indonesian consumers, the nation and local manufacturers
- LBNL recommends harmonization of MEPS with updated ASEAN countries targets and align label Star levels with China and other international markets.
- LBNL recommends the design and implementation of complementary programs to drive down costs and encourage adoption of efficient technology:
 - Education/Awareness programs
 - Green Procurement
 - Buyer's Clubs Programs
 - Manufacturer Incentives
 - Utility Rebate Programs

Conclusions and Recommendations (2/2)

- A comprehensive set of interventions, if implemented wisely, will activate a virtuous cycle that promotes innovation of new and efficient technologies, spurring economic growth (saving consumers money and manufacturers retooling costs), reducing peak electricity demands, and achieving environmental and health co-benefits (Figure 21, left). Such a cycle lifts national development indicators while strengthening a country's political and economic capital. In contrast, failing to implement these complementary policies will perpetuate a vicious cycle in which growth stagnates and the market is trapped in technology lock-in for decades (Figure 21, right).

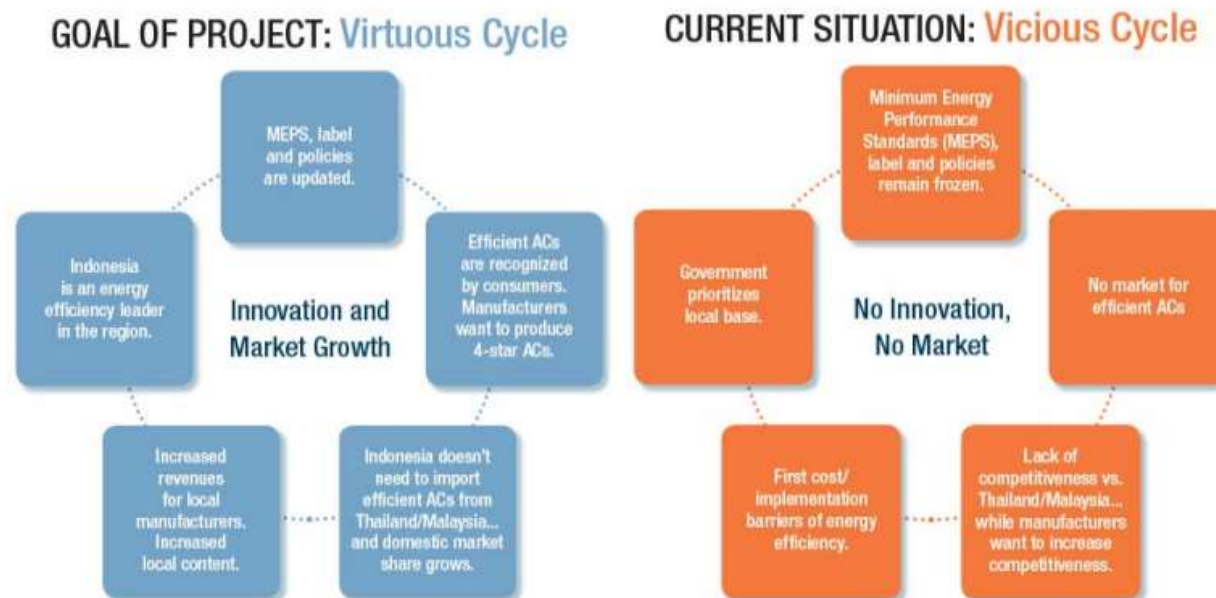


Figure 21. Virtuous cycle of high-efficiency AC innovation and market growth due to policies (left) vs. current vicious cycle resulting in no high-efficiency AC innovation or market in Indonesia (right) (Letschert et al., 2019)

For more information:

<https://ies.lbl.gov/region/indonesia>

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